American Gas Journal

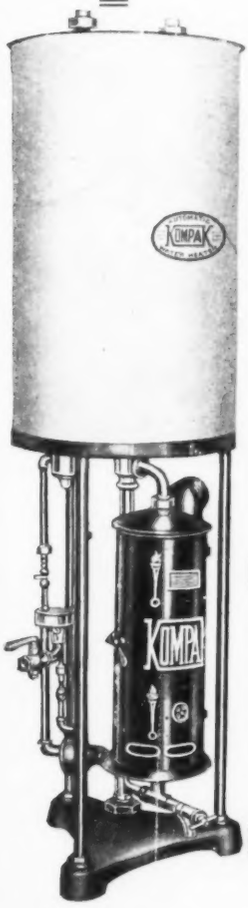
Formerly American Gas Light Journal

EST. 1859

VOL. 115, NO. 24
WHOLE NO. 3327

NEW YORK, SATURDAY, DECEMBER 10, 1921

Subscription $3 per year
$4 Canada $5 Foreign



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Small Plants *which are* Highly Profitable

The correctness of the principles of Semet-Solvay construction is demonstrated conclusively by the success of Semet-Solvay plants whether large or small.

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1891—Pioneer in the Development of the By-Product Coke Oven—1921

SEMET-SOLVAY BY-PRODUCT GAS OVENS

American Gas Journal
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Vol. CXV, No. 24 NEW YORK, DECEMBER 10, 1921 Whole No. 3327

Hand Tools

Their Safe Use Under All Conditions

By R. H. GUERRANT and J. J. LAMB

Even in this age of machinery many operations are still performed largely, if not wholly, by the use of hand tools. These operations include fitting up or assembling in metal working plants, die sinking and metal pattern work, wood pattern, cabinet making and carpenter work, hand forging and blacksmithing, saddle, harness and cobbler work, telephone and telegraph line work, railroad track work, most mining operations, etc. Statistics show that hand tools contribute a large portion of accidental injuries in industry. For instance, in the State of California, out of 62,241 accidents 5,731 were due to defective tools, and their handling.

Ordinarily the thought of danger is especially associated with power-driven machines and although these do cause many accidents it will be found that a surprisingly large proportion of accidental injuries in all shops occur in the use of hand tools. The possibilities of accidents in connection with machines are easily apparent, but the progressive manufacturers of today, by the installation of practical guards, have eliminated these hazards to a great extent. It is different, however, with hand tools. These are apparently quite harmless, and that is one reason why many accidents occur in their use. Mishandling hand tools, neglecting them in dangerous places, are frequent causes of accidents.

It is an interesting subject, this, that of properly using hand tools. Also it is a most important one. This article is one of the series on safety that is being published in the "Journal" and which has attracted so much favorable comment.—Editor.

Material

It is of prime importance that the best material be used for making hand tools. Too often purchasing agents do not realize the hazard introduced by using inferior material, or the actual loss in production and the greater ultimate cost of the tools. As a result, the chisels, punches, drifts, etc., made from poor stock soon become dull, and their heads upset, mushroomed and cracked. There is no economy or safety in buying anything but the most suitable grade of tool steel for hand tools. This does not necessarily mean that it is essential to buy special expensive brands of alloy steels from which all tools are to be made but that the proper grade should be provided for the various purposes. In every plant careful consideration should be given to determining the proper specifications for steel used under different conditions, and to seeing that these specifications are met. A standard form of steel specification should be attached to every purchase requisition for such material; otherwise it is impossible to place the responsibility for inferior materials upon the purchasing department. Upon arrival, incoming shipments should be tested as to quality, so that inferior material may be rejected.

There are several ways of distinguishing tool steel from machine steel, but probably the most handy for mechanics is the emery wheel test. To test a piece of steel touch it lightly to a dry emery wheel and observe the sparks. A high carbon tool steel gives out a spark which bursts into a brilliant star-like point of light when it strikes against any object. Sparks from a low-carbon steel, on the contrary, are dull, incandescent particles. Air hardening (tungsten) steel gives off a red spark. For ordinary purposes this test will serve to distinguish the grade of the steel should it become mixed.

Forming and Tempering Hand Tools

Probably no one thing contributes more to safety in the use of hand tools than does care in manufacturing the tools—especially proper tempering. The forming and tempering of steel tools is a science in itself; no attempt will be made here to cover this important subject. Tool steel of different compositions requires different methods of treatment. The method

used in tempering tools should depend on the work for which the tools are to be used. All tool steel must be annealed before it is worked and the proper annealing temperatures for various grades differ. Frequently, local hardening of only a certain portion of the tool is desired.

Several methods of tempering tools are used for securing different results, each having its own advantages. The most common method of tempering hand tools is the color method in which the temperature of the metal is gauged by its color. Other methods are: Oil tempering baths, load baths, cyanide of potassium and barium chloride baths, sand tempering, and oil heated furnaces. Various hardening or quenching baths, too, are used for securing different results, such as pure water, salt water, soapy water, sweet milk, mercury, carbonate of lime, wax, tallow, air (mostly for high speed steel), and oils.

It is at once evident, therefore, that if the best results are to be had with hand cutting tools the services of an experienced person are needed in the manufacture of the tools—some one who has a knowledge of the peculiarities and characteristics of metal as well as of the advantages of certain processes of treatment. It is a decidedly bad policy to entrust the making and tempering of tools to any one except an experienced person.

The makers of special steels always furnish instructions for working their particular brands so that where competent men handle the work no difficulty need be encountered in making and tempering the tools. The directions should be carefully followed except in cases where experience has shown the advisability of varying the method for some specific purpose.

Tool Handles

Very frequently, companies attempt to realize a saving by buying cheap grades of handles for hammers, drifts, picks, and other tools. The handles of all hand tools should be of the best straight-grained material. Should a hammer or chisel handle break, some workman may be seriously injured by the flying head. Splintered handles also are a common cause of lacerated hands, especially on picks, shovels, axes, sledges, etc. Buy good handles and keep a sufficient supply on hand in the tool room.

Particular care is necessary in fitting the handle to the tool. All handles should be properly fitted and securely fastened in place. If workmen are permitted to use nails, wedges, and similar methods for fastening handles on tools the likelihood of accidents caused by flying tools is greatly increased.

Tool Room

Mechanics and machinists ordinarily have their own tool kits containing one or more machinists' hammers, calipers, gauges, and other such tools. It is customary, however, in most shops for the company to supply all cutting tools such as chisels, as well as sledges, hammers, picks, shovels, etc. Since so many accidents result from chips flying from mushroomed heads of tools, and from hammers and other tools with splintered handles, or handles not properly fitted, it is advisable that there be inspections of all hand tools by the foreman or crib man.

There are many hand tools which, though belonging to the company, are in constant use by some skilled workman. A good workman takes as much pride and care in these tools as he would in his own personal property. A man of this type should be given consideration and allowed to keep a few of the company's tools in his own tool box or drawer. To see an unskilled man abuse a good tool makes a skilled man's blood boil as much as to see a horse whipped. Naturally, there should be a method of checking up these tools. A good man will not resent an inspection from time to time of the company's tools which he has out.

The tools used by unskilled men should be turned in at the end of each day, inspected by the foreman or crib man, and all necessary repairs made before being checked out again. By this method, the company may be sure that only safe tools are in use.

The tool room attendants should be held responsible for the inspection and care of all tools and should see that no tool is put into use which has a mushroomed head, an improperly fitted handle or is otherwise defective. They should realize the necessity for having all tools in the crib racked safely so that any jarring with consequent possible injury to those standing near by may be avoided. It is also dangerous to overload the top shelves and racks.

Types of Hand Tools

The hammer is the most commonly used of all hand tools and at first thought one would not consider it to be the cause of many accidents. There are a variety of types of hammers, each of which is suited to some particular class of work. The nature of the work is the controlling factor in the type of hammer to be selected. Frequently accidents happen because the wrong kind of hammer is used.

Soft metal hammers should always be provided for striking tempered or case hardened tools. To use a hardened hammer on hard steel is dangerous because the tool or hammer may break and a flying particle may strike the workman or some fellow worker in the eye. Soft hammers for striking tempered or case hardened pieces of steel are usually of copper, lead, rawhide, or wood. They are sometimes made by filling a copper pipe with lead and then fitting a handle through the hammer. If it is necessary ever to use hammers in buildings when explosive gases or vapors are present in the air, due care must be taken that soft metal hammers are used in striking piping and machinery. This prevents the possibility of sparks, which might cause an explosion or fire.

The dangerous practice of using a battered piece of brass or copper to receive the blow of a hammer, while pounding hard metal or making a drive fit, cannot be ignored. Experience has shown that a severe blow will sometimes cause some of the already battered metal to fly off with sufficient force to penetrate a man's body, possibly causing poisoning due to the composition of the metal. Only a new piece of brass or copper should be used for this purpose.

Hammers and hatchets used by box makers and carpenters frequently have a corrugated driving face to prevent nails from flying when struck by the hammer. These hammers have been found by a number of member companies of the National Safety Council to give complete satisfaction.

(*Continued on page* 530.)

Beehive Coke Ovens with Central Generator

Results Obtained in Smaller Gas Plants

By H. KLEINHOLZ (Das Gas u. Wasserfach, 1921, 619-623)

Translated and Adapted by Ismar Ginsberg, B.S., C.E.

It is not so very long ago that many gas technologists had grave doubts as to the possibility of using beehive ovens for the manufacture of illuminating gas in large plants. The question whether these beehive ovens could be heated with gas from a central gas generator was also a subject of much discussion. After a series of large installations had been operated with success, all these doubts were dispelled. However, they still exist, in so far as the use of these ovens in the smaller gas plants is concerned. The Haspe gas works is an example of such an installation, and the success that has been attained in this plant indicates that the use of beehive ovens with central gas generators is also justified and advantageous in the case of works which produce 3,000 c.m. of gas a day and upwards. The firm of Dr. C. Otto & Co., of Dahlhausen-Ruhr, built the vertical beehive ovens in the Haspe works in 1920 and since the middle of November of that year this plant has supplied all the gas used in the town of Haspe.

Our readers, we feel sure, will be greatly interested in the accompanying article, for it is a very lucid recounting of actual operating conditions. Considerable discussion was aroused when this article was published abroad.—Editor.

Figure 1 (390 in article), shows the actual construction of the oven. In a block 7.7 meters long, 2.8 meters wide and 4.6 meters high, there are six units, each of which can hold 2,300 kilograms of coal. The chambers are charged from an overhead traveling bucket arrangement, through openings in the top of the units which are closed with cast-iron covers. The openings in the lower part of the chambers are closed by means of wrought-iron doors, which can be turned on hinges. When these doors are opened, the solid mass of coke falls out, breaking into pieces and filling up trucks into which the coke falls. The coke trucks are then placed on a conveyor and sent to the quenching tower, where the coke is dumped into a quenching gutter leading to the same.

The coke mass is heated only on its longitudinal sides in the course of its formation within the oven. The top and bottom of the cake of coke are not heated, which avoids the formation of a splintery product. Figures 2 and 3 (391 and 392 in article) show the appearance of the coke in both cases. Figure 2 shows a cross section of a mass of coke which has been heated only on the longitudinal sides, and figure 3 shows the coke mass, formed by heating on all four sides. In the middle both masses of coke are well formed, and give large pieces of salable material, but figure 3 indicates the existence of an entirely different condition at the ends. It is evident that the heating of the coke mass at the ends is not only unnecessary, but that it hinders the formation of good usable coke and promotes the production of coke dust. While it can thus be clearly seen why the heating of the ends of the oven is entirely wrong, even more conclusively does figure 4 (393 in article) prove that the use of annular shaped heated retorts is far more disadvantageous. It is very evident from the figure why it has been found that the coke obtained from such retorts is entirely unsatisfactory for the common technical purposes. If a good coking coal is heated first in the annular retort and then in the oven, which is heated on the sides only, then, of course, the same quantity of coke will be obtained in both cases. But in the correctly heated oven, of the 75 per cent coke yield 70 per cent will be good coke in large lumps, while in the retort about 50 per cent of the output will be in the form of small pieces of coke or coke dust. The loss in the selling price of the coke is very considerable.

Figure 5 (394 in article) shows one unit in an experimental installation of ovens, erected by the Otto Company, with part of the coke cake thrust out of the heating chamber. From top to bottom the coke is of uniform structure. Right at the bottom there is seen a moderate amount of splintery coke formation, which is due to the fact that in horizontal ovens it is not possible to avoid altogether the heating of the chambers at their lower ends.

In the use of the vertical oven there is found still another basis for the choice of chamber ovens instead of retorts. In the retort the weight of the coke is comparatively small in comparison to the force with which it tends to stick to the walls of the retort due to the unevennesses in the same. If there is the slightest deformation in the retort, or if there is a deposit of graphite formed on the interior surface, a certain amount of the coke will remain sticking to the retort, after the coke is discharged. It is then necessary to remove the same and this constitutes a

costly and tedious process. On the other hand, if vertical chamber ovens are used and are allowed to stand twenty-four hours, then the weight of the large mass of coke overcomes this tendency to stick to the sides of the chamber, and all of it is discharged in a single mass.

The Processes Involved in Coking

The illuminating gas, which is evolved during the distillation of the coal, rises to the top of the chamber, escapes through a gas outlet, located near the charging hole and passes through the water-cooled individual condensers and then into the gas main.

In figure 6 (395 in article) there is shown a section cut through a piece of partly degasified coke The heat from the hot walls penetrates the coke in the direction of the arrows. In the middle of the coke there is still unchanged coal. At the edges the coal is completely coked.

When the chamber is filled with fresh coal the heat, radiating from the hot walls, enters the carbonaceous

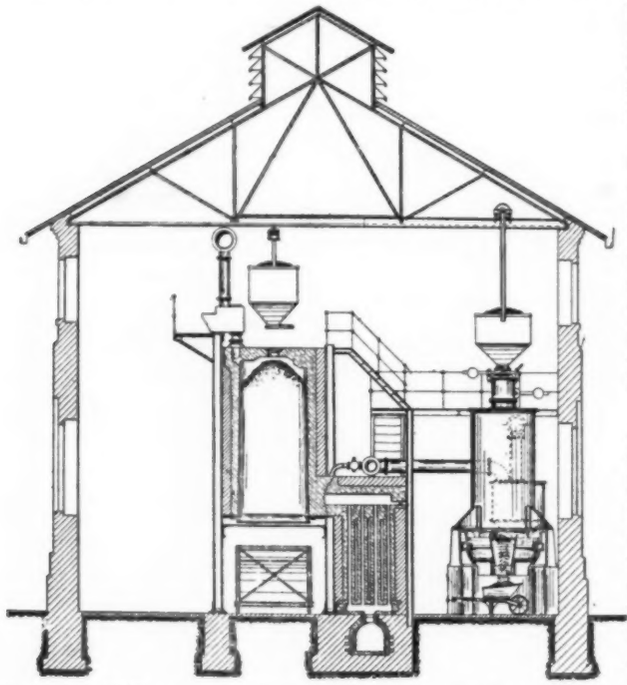

Figure 1 (390 in article)—Cross section of a vertical chamber oven installation with a central generator

mass. The moisture in the outermost part of the coal is evaporated. The water vapor is distilled through the mass of coke, whereat a part of it is condensed again. After the dried layer of coal is warmed up again, it is converted into a tarry, pasty mass which, on further heating, is decomposed with the evolution of gas. The gas, mixed with tar, seeks the same way out as the water vapor did. A part of the tar, consequently, reaches the cooler moist layer of coal and is condensed thereon in such a manner that it forms an impervious coating by which the gas is prevented from penetrating into the interior of the mass of coal. Hemmed in between the undecomposed layer of coal and the hot wall lies the layer of coal which is, in the course of decomposition, continuously evolving more gas. In order to secure room for itself and a path where it can escape, the gas forces passages for itself through the pasty mass. The rate at which the heating is carried out has a marked effect on the way this procedure takes place.

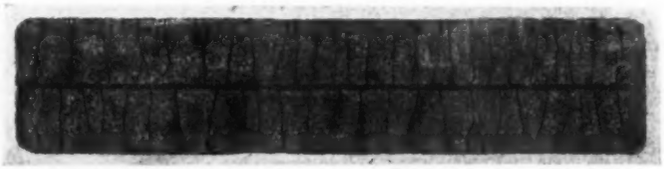

Figure 2 (391 in article)—Coke cake from a chamber heated on two sides only

The greater the quantity of heat that is fed to the coal within a given unit of time, the greater the evolution of gas and the more room the gas will require. Consequently, the passages which the gas forces through the pasty mass will increase in width, or what amounts to the same thing, their number will be increased. As the heating progresses, the section of the coal which is undergoing decomposition moves further and further into the coal, leaving behind it finished coke. A diagrammatic representation of the process is seen very clearly in figure 6.

The degasified and glowing coke conducts the heat from the hot walls of the oven into that part of the coal which is being coked. The colder section of the coal in progress of decomposition consists on the one side of a layer of partly degasified coke, and on the other side of a layer of thick tar, and between the two there is found the transition layer. Right close to the layer of thick tar, there lies a layer of coal which forms a sort of thin barrier between the coal which has started to decompose and the coal which is still in its original condition.

When the progress of coking is carefully followed out in this manner, then the reason may be deduced why so many apparently worth-while innovations have all proven unsuccessful. For example, an experiment was made in which it was attempted to draw off the gas along with various by-products mixed with it from the inner layers of the coal. The contention was that if that were done it would be possible to avoid having the gas and the tarry products contained therein come in contact with the hot coke and glowing walls of the oven. If it were possible to do this, then the output of tar would be in-

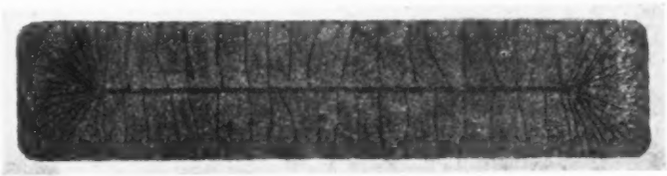

Figure 3 (392 in article)—Coke cake from a chamber heated on four sides

creased to a considerable extent and the condition of the tar would approach that of regular coal tar. Many attempts have been made to accomplish this, but with no success. The technologists would have been spared much time, trouble and expense, if they had studied first the progressive formation of the coke, as outlined above, which would have indicated to them at once that it was impossible for the gases

and tarry vapors to penetrate the dense layer of coal which is still in the undecomposed state.

The degasification process, to be sure, can take place only in the manner indicated above, when the coke cake possesses no large hollow spaces. For example, if the chamber is filled with nut coal in large lumps without the addition of finely broken up coal, then the resistant layer of coal is formed incomplete-

Figure 4 (393 in article)—Coke cake from a retort heated on all sides

ly only. When this happens, then the gases will be evolved from the interior of the coal as well as from the outer surfaces. Accordingly they will surround any pieces of coal that obtrude in their path with a circle of flame so that the coal is heated on all sides at once. Each piece of coal behaves under these circumstances just like a chamber full of coal would: that is, it is degasified in the same manner as we have described above for the case of a unit in the beehive furnace. However, it is very evident that, when operating in this fashion, it is quite impossible to produce large lumps of coke. There is no reason at all why many gas plants cannot make the more valuable kind of coke, instead of large proportions of low-priced coke dust, by merely exercising the proper

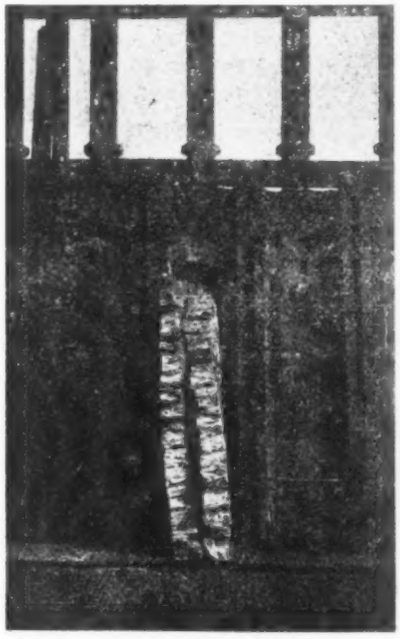

Figure 5 (394 in article)—Coke cake emerging from Furnace

care in the selection of the coal used in the oven charge.

If the coke cake is examined on its egress from the chamber, it will be seen that it is made up of a large number of pieces which appear to be all of the same size. The formation of these is due entirely to the action of the evolved gases and vapors in their passage through the pasty mass of coal in the furnace. This gives rise to the many cracks and splits that are seen in the coke cake. When we draw closer to the emerging mass of coke, then it is remarked that these channels or passages or cracks are widest near the outer surface of the coke mass; that is, at the points which were nearest the hot walls of the furnace, while in the interior of the coke cake they are narrower and the further away from the surface they are the narrower they become. That part of the coke which lay closest to the walls of the furnace has a cauliflower-like appearance. The explanation of the structure of the coke is found in the fact that the layer of coal, which lay nearest the hot walls of the chamber, is naturally heated the hottest and consequently the evolution of gas there is the most violent.

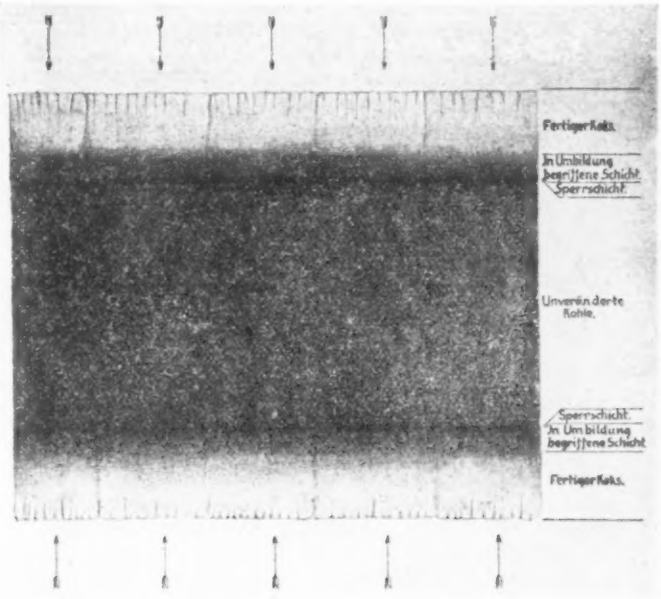

Figure 6 (395 in article)—Cross section of a partly degasified coke cake from top to bottom; finished coke; layer of coal in course of decomposition; separating layer; unchanged coal; separating layer; layer of coal in course of decomposition; finished coke

The large amount of gases produced and their pressure resulted in the coal in this locality being compressed very strongly, and at the same time in the formation of an extraordinary large number of air passages through the pasty mass. As the distance of the latter from the hot chamber walls increases, the number and the width of the channels decrease, because the rate of gas evolution decreases with this distance. When the density of the coke is determined, then it is found that the coke in the cauliflower formation has the greatest density, which decreases the nearer the coke is to the center of the chamber. The conception that it is possible to obtain an especially porous coke by heating the coal sharply and allowing it to remain in that condition for a short time only before discharging the furnace, an idea which has been worked on by many experimenters with no success, is false, as may be concluded

from the observations made above. The conditions for the formation of porous coke are just the opposite and it is evident from our experience that the most porous coke, hence the coke possessing the lowest specific gravity will be produced when the rate of heat, fed to the coal, is at a minimum.

Production of Water Gas in the Chamber Furnace

When the degasification of the entire mass of coal is completed, then the coke cake, if the drying process and the heating has been conducted in the proper way, possesses a temperature considerably less than 900 deg. Cent., hence a temperature which is unsuited for the manufacture of water gas. It is impractical to utilize the heat in the finished coke, which is accumulated during the normal coking process, for the manufacture of water gas. Nevertheless, the process of coking of damp coal is justified by certain operating advantages gained thereby. It is to be remembered that the increased evolutions of gas stipulates that the temperature of the coke mass must be increased, due to the stronger heating, above the limit which is required for the degasification process. The additional heat is obtained by special firing of the furnace which is expensive. Exhaust steam may be used in the wet method of operating the chamber ovens provided the steam is first superheated before being introduced into the chamber. In the newest installations erected by the Otto Company means are supplied for superheating the steam to 300 deg. Cent.

The Quality of the Tar

The tar that is obtained from the vertical chamber ovens is extremely thin liquid. The tar produced in the Haspe works has a viscosity, according to the Engler method, of 7 at a temperature of 20 deg. Cent., while the viscosity of normal tar, produced in the coking of coal, is 28 and that obtained from horizontal retorts amounts to 55. The distillation of an average sample of the Haspe tar gave the following results:

Water	1.2 per cent
From 0 to 200 deg. Cent.	13.1 per cent
From 200 to 300 deg. Cent.	27.4 per cent
From 300 to 360 deg. Cent	26.3 per cent
Pitch residue	30.6 per cent
Loss in distillation	1.4 per cent

The striking fact is that this tar contains not the slightest trace of naphthalene. Likewise, it is impossible to detect any naphthalene in the evolved gases. From the fraction which distilled over between 300 and 360 deg. Cent., in addition to anthracene quite a large quantity of washing oil is obtained. It was found that the Haspe tar was especially suited for the manufacture of gas washing oil, such as is used in the recovery of benzol and toluene from gas. The tar yields 30 per cent of this product at the least. the flash point of the tar, when it contains its normal amount of water, lies between 40 and 45 deg. Cent., and its burning point between 70 and 80 deg. Cent. At 15 deg. Cent. its specific gravity is 1.09215.

The Heating of the Ovens

The chambers are heated on their longitudinal sides only by means of gas, which is produced in a rotating grate generator. The gas produced in this machine is always of uniform quality and composition, and before it is burned in the ovens, it is purified by passing through a dust separator, which removes all the dust suspended in it. The separator is insulated so as to conserve the heat. The hot gas is distributed over the walls of the individual chambers according to the requirements of the occasion. The air, that is used in the combustion of the gas, comes from a heat recuperator which is built right into the ovens, so that it is preheated prior to its entrance into the combustion chambers, the preheating being accomplished by the heat which streams out of the ovens and is led over and around the recuperator before being discharged into the stack. Each unit of the furnace is provided with gas, air and waste hot-gas regulators, so that each may be treated according to the peculiar conditions surrounding its operation. The furnaces are made from the best grade of silica brick and are built very strongly.

The Rotating Grate Generator

The rotating grate generator, which is used to produce the hot gases, is built entirely independent of the coking oven itself. The coke falls from the overhead traveling conveyors into a loading hopper and, when the conical-shaped bottom closure is opened, the material is charged into the generator. The very thoroughly burned slag, which remains after the gasification is completed, is removed through a door near the bottom of the generator and falls into a vessel filled with water, which is also provided with a rotating bottom, and from there the slag is dumped into conveyors and carried away to the dump pile. The air required for the combustion of the coke is blown under the rotating grate by means of a small fan. The grate is made in such a manner that the air is distributed uniformly throughout the layer of combustible. The generator gas, obtained in the gasification of the coke, possesses a maximum heat value of 1,200 to 1,250 heat units per unit volume, figured at 0 deg. Cent. and 760 mm. pressure. The greater part of the dust in the gas is removed as the latter passes through the upper part of the tall column of the generator. The dust which still remains in the gas as it emerges from the generator is removed in the aforementioned dust separator.

In comparison with the individual generator installation, the central generator arrangement possesses some very important and weighty advantages. There is by no means so much labor entailed in the handling and removal of ashes and slag. The quality and the pressure of the heating gases fed to the oven chambers are not subject to any variations, and as a result thereof, it is possible to carry out the combustion of the same in the oven continuously and without any worry over the uniformity of the heating. It is possible by the mere turn of a hand wheel to increase or decrease the intensity of the heating of any unit of the furnace or of the entire installation, according to the existent conditions. It is consequently possible to regulate the production of gas in the generator according to the requirements of the coking ovens. The losses in the passage of the generator gas from the

(*Continued on page* 525.)

Co-operation of Employees and Public Needed

If Utilities Are to Give Best Service These Must Be Secured

A. W. Thompson, president of the Philadelphia Company, Pittsburgh, Pa., in an address before the recent convention of the Pennsylvania Electric Association, gives many valuable hints to utility operators. He stated that friendly co-operation on the part of the public is an absolute essential to rendering good public service by public utilities. In his talk, Mr. Thompson said in part: "Service to our patrons is, of course, the first thing which comes to our minds. And yet many of the employees and some of the officers of public utility companies give little thought or attention to this phase of what should be much of their work. In many cases the employee of a public utility feels that he has done his duty when he goes to his office in the morning and leaves in the evening, having done what is commonly known as the allotted work for that particular day. Because of this limitation in service there has in the past come about many misunderstandings between the public, public utility officers and their employees, and which has spelled failure for some companies, injured communities which should have been served well, and worked an undue hardship on the employees. It goes without saying that it is much easier to work for a successful company than for one which is a failure.

The three points which Mr. Thompson brings out in this paper have long been recognized as essentials, but it is seldom indeed that they are so succinctly presented. You will find this article worth your while.—Editor.

"Part of the daily time of every public utility employee should be given to meeting with people, helping to bring about an understanding and feeling of confidence as well as keeping the public thoroughly informed as to the mutual benefits than can be brought about only through co-operation. In making for such a situation there must be no mystery made in public utility problems. Free and open discussions must be had, coupled with co-operation on the part of all parties.

Co-operation Is Needed

"Friendly public co-operation is one of the most valuable assets that any public utility company can possess. Without it the road is rough and sometimes impassable. Toward securing it, there must be good company management upon which is impressed a deep sense of duty growing out of responsibility. There must be municipal co-operation, all implying that there must be adequate service requiring reasonable rates, yielding sufficient revenues to enable utilities to render it, to maintain the property in a condition to function, and to yield a fair return to investors whereby more capital when needed can be attracted.

"This brings me to the next thought in connection with service, and that is service to the investor. Without credit, utility companies cannot attract the necessary capital to furnish the service demanded by the communities which they serve. Every community is daily demanding more and better service. Public utility companies cannot cease expanding and making improvements. The population of our country is increasing by leaps and bounds. Great difficulties present themselves to every public manager, especially in the acquiring of sufficient funds to add to and improve the facilities of his company. It is estimated that in the United States more than a billion dollars annually is required in the electrical industry alone to keep up with the demands for service. Without credit and without a kindly feeling on the part of municipal authorities this money cannot be acquired on any reasonable basis of financing, if at all.

Protect Investors

"We only need to look at some of the public utilities around us, such as the steam railroads and the electric tractions, to note the deplorable condition existing in those lines to-day, and which are affecting all of us. So that, after service to our patrons, the next duty is service to our investors in securing for them an adequate and fair return on their investment. There is no way to compel people to invest their funds in public utility securities. It only can be done on a basis of confidence. In this connection some few only seem to realize that the future of a community rests largely upon the service rendered by its public utilities; that is, transportation, both trolley and railroad service; electric light and power, and gas for domestic use.

"One of the great services, which is quite a new

direction, and which will be steadily developed, is to bring about an elimination of absentee landlordism; that is, the greater part of the problem of the moment is not one of things or materials, but of human beings just like you and me. We know much of the materials and forces of securities of utilities to be held by the people of that particular community or those particular communities—and thus control the company or companies which serve them. This will bring about a greater local interest and supervision, both as to the attitude of the municipal officers to the company as well as the officers of the company to the public and the municipality.

"Now last but not least is that of service to employees—relations between officers and men. The great nature, even though that much is but a small beginning, as witnessed by the strides we are making along every avenue of knowledge. Yet, withal, in comparison with what we know of the materials and forces of nature, our knowledge of men and women is apparently small.

Mistakes in Promotion

"To be candid with ourselves, must we not confess that in this direction we have been a good bit of a failure? In this present business depression in this country, it is of much concern to know that there are more than three million men out of work.

"How often it occurs that without a proper study of their qualities men are promoted to positions which they cannot successfully fill, only to find after a period that they have been a failure and must be pushed back or eliminated from the service of that particular company. This injures them greatly and their families suffer because of having become accustomed to living on the increased compensation which the employee received through promotion. What an appalling situation there is in any family when this happens—and yet how often it seems to take place! Then again, in the hiring of men not sufficient attention seems to be given to ascertaining whether they are competent for the positions at hand.

"Also, junior, as well as higher, officers of the companies do not seem to give the attention to the training of employees in their work and their duty toward the company and the community as they should. So many do not have the incentive because they do not know how to take up their portion of the burden of public and civic work in their communities. With some encouragement along these lines, there is no doubt but that many, if not all, employees would be willing to give some part of their time to the work of helping bring about better civic conditions. In doing this they would not only be helping their communities but themselves and, indirectly, their company.

"In summing up these three kinds of service—service to patrons, service to investors, and service to employees—what a great responsibility lies upon the shoulders of public utility officers and their companies! These services may be condensed into two words—"public service."

A Good Salesman

The day of the "order taker" has passed. During the times when it was more a question of being able to supply the demand—getting shipments through for prompt deliveries—than of price, which was a secondary consideration, there was not the real opportunity for actual selling on the part of the men supplying the already created demand. The majority of the so-called "order takers" have found other callings and to-day the man who calls upon you has something worth while to say; otherwise, during a time of depression and unusually high expenses, he could not be retained by the firm he represents. Listen to him.

I remember reading some place a few points on salesmanship which were recorded and summarized by one who had interviewed a number of sales managers of large businesses and had obtained many ideas as to what is required of a salesman who is to make a success of his work. The value of the opinions of those whose work is chiefly that of dealing with salesmen is appreciated by those of us who are trying to improve selling methods and the manner in which we meet our public. Some of the thoughts reflected are absolutely essential and necessary for the success of every salesman and the firm whose product is being sold, and they should be studied with the thought of applying them, as far as possible to each day's selling.

"The day of close buying is still with us and buyers of material in all lines are buying only necessities, so that real salesmanship and ability to give service in deliveries and quality of material is what counts." Some salesmen have a way of meeting prospective buyers, which at the outset is a failure. It is feared that the buyer is waiting for opportunities to place him, the salesman, in an uncomfortable position. The thought emphasized by the recorder in this instance was that the essential point is manliness, and that a man who has his firm behind him with what he believes to be the best material of its kind to be obtained has nothing to fear.

The second thought applies to the things which must be cared for by the salesman alone. It is personality. "A readiness to smile and meet everyone on the footing of equality, a readiness to be of service always, and a clean gentlemanly appearance. These are the factors to be controlled wholly by the salesman, and they are the principal things his firm pays him for. A good salesman is one who knows every valuable feature there is in the philosophy of a busy normal man, one who can study character to the extent of knowing honesty and right intent, and who is willing to face his own mistakes and to profit by what they have given him in wisdom."

The man who knows both his goods and how to sell them is a salesman. He must know the wishes of his customers and the position of his firm so that he will be able to act as mediator in matters of adjustment which may arise and which, unless satisfactorily adjusted, will result in a lost customer.

"There is no limit to the good a real live-wire salesman can do. It is in his power to make friends where friends are most useful. He is a carrier of good things and cheer, of live interest and wholesome knowledge of the big field of human endeavor. What more could any man ask?"

A Correspondent.

As the Journal Views It

Ismar Ginsberg Appointed Associate Editor

Seeking constantly to add to the value of its service to the gas industry, the AMERICAN GAS JOURNAL announces the appointment of Ismar Ginsberg, B.Sc., Chem. Eng., as associate editor. Mr. Ginsberg is recognized as one of the foremost chemists of the United States and his work in the laboratory as well as his reports, which have been widely published, have created a wide following for him. Mr. Ginsberg in his work for the AMERICAN GAS JOURNAL will particularly devote his attention to the chemical branch of the industry and will ever be at the service of any company in aiding in the solution of any problems.

Another feature of Mr. Ginsberg's work, which, we feel sure, will meet with the approval of the gas industry, will be to watch carefully all of the journals published abroad, in all languages, and to translate and adapt such articles as will be of help to gasmen in this country. The JOURNAL already has published several translations by Mr. Ginsberg which have met with marked approval.

Reports received from all over the country show that the by-product end of the gas business is coming more and more to the front and Mr. Ginsberg, because of his wide experience, will be of inestimable value in this work.

Within a short time, it is hoped that the JOURNAL will be able to announce further activities on the part of Mr. Ginsberg and we hope that all, who are in any way connected with the gas industry will avail themselves of the services of Mr. Ginsberg which are now obtainable through the AMERICAN GAS JOURNAL.

The Kinds of Service Needed

The three kinds of service which A. W. Thompson, president of the Philadelphia Company, Pittsburgh, Pa., points out are essential to the well-being of a public utility will bear studying by all who have come into contact with the policies of gas companies. These three services, which we feel will bear repetition in these columns: Service to patrons, service to investors, and service to employees, are to our way of thinking placed in their proper sequence. No utility can possibly survive unless it has a proper conception of the service that it must render to its patrons. For a time it may appear to be getting ahead but eventually it will have to reap the fruits of its actions and those companies that are operated with the fundamental idea of service to its consumers will quickly realize how valuable an asset this can be.

Of equal importance, although more indirect, is the service to investors. Those who have placed their trust in a commuinty by means of investing their savings and capital in a public utility are deserving of great consideration. They must at all times be protected and those regulatory bodies that believe that their powers are for oppression rather than for protection of all concerned are guilty of a gross breach of trust. Can they long survive in the face of the fact that more and more companies are being operated on capital furnished by their own consumers? We think not, and those who attempt to continue this kind of policy in force will be brought up with a short turn and will find that public opinion is against them. They will be forced to change their policies and if they continue to refuse they will soon be without position or power.

The third kind of service referred to by Mr. Thompson is coming more and more to the front. Some of the largest companies in the United States have granted employee recognition which they have found has produced returns that have been immeasurable. We feel that this movement cannot spread too rapidly and we are glad indeed to see that it is not confined to any one section of the country but rather is becoming universal.

This speech of Mr. Thompson's deserves the earnest consideration of every man connected with the gas industry. It points out the way to future prosperity and its decisiveness in laying down rules adds to its value. The explanatory remarks of each rule shows how carefully Mr. Thompson has weighed his words and how closely he has considered each part. Mr. Thompson's speech is one of the worthy contributions to the literature of the year on this subject.

Beehive Coke Ovens with Central Generator

(*Continued from page* 522.)

individual generators to the individual recuperators are avoided. The loss due to unburned combustible in the ash does not exceed 1.5 per cent.

The Operation of the Oven

The operation of the vertical coking ovens with a central gas generator in the Haspe works has been fraught with such success that the question as to the applicability of such installations in industrial gas plants which produce 3,000 c.m. of gas a day has been answered decidedly in the affirmative. The long time of standing, which is attained by the choice of a large chamber width, is also a very advantageous circumstance in the operation of the plant. This time is twenty-four hours. The Haspe oven possesses six chambers. Under normal operating conditions, all six are emptied once a day. Three units are discharged in the morning and three in the afternoon. When the number of units in operation is reduced, due to lack of coal or gas, then the discharging of the units is divided equally between morning and afternoon as far as is practical.

Determination of Hydrogen Sulphide in Illuminating Gas*

Discussion of Various Methods

By C. W. JORDAN and W. H. FULWEILER
United Gas Improvement Co., Philadelphia, Pa.

In attempting to increase the efficiency of purification it is frequently necessary to know accurately the amount of hydrogen sulphide at the outlet of the several boxes. This information is particularly important as to the gas at the outlet of the last working box before it enters the catch boxes.

It is well known that the ordinary lead acetate paper is so extremely sensitive that it does not differentiate between very small fractions of a grain which might well be allowed to pass into the catch boxes, and, say, 2 or 3 grains, at which point it might be best to change the box.

In making a number of tests in this connection it was found that the methods usually given in the handbooks for the determination of hydrogen sulphide give rather erratic results, and it was decided to investigate the matter with a view to developing if possible an accurate method for the determination of hydrogen sulphide, primarily in quantities from traces up to a few grains; say, 15 or 20 per 100 cu. ft., above which point the errors in the Tutwiler H_2S burette are not serious, as the results obtained are sufficiently accurate for purification control.

As a result of the work that has been done it is found that neither acid nor alkaline solutions will give accurate results.

The degree of acidity that may be allowed has been determined, and it is believed that an accurate method for the determination of small quantities of hydrogen sulphide has been found.

Methods for the Determination of Hydrogen Sulphide

The literature gives quite a number of methods for the determination of hydrogen sulphide, although in many cases these methods were not designed for use with coal or water gas.

Probably the most work on the determination of hydrogen sulphide has been done in connection with the determination of sulphur in steel by what is known as the evolution method. Here the steel is dissolved in acid and the hydrogen sulphide evolved is absorbed and determined either gravimetrically or volumetrically.

Among the gravimetric methods is that in which the hydrogen sulphide is absorbed in potassium plumbate, the lead sulphide is oxidized and the sulphur determined by precipitation as barium sulphate. Another method (Morrell, *Chemical News*, XXVIII, 229) absorbs the hydrogen sulphide in ammoniacal cadmium chloride, the cadmium sulphide is filtered off, washed with ammonia water, dried and weighed as such.

Ammoniacal silver nitrate is also used. In this case the silver sulphide is filtered off, oxidized with nitric acid and, after removing the silver, the sulphuric acid is precipitated with barium chloride.

Fresenius (*Zeitung fur Anorg. Chemie*, XIII, 37) has suggested oxidizing the hydrogen sulphide in a hydrochloric acid solution of bromine. After boiling off the bromine, the solution is neutralized and the sulphuric acid is precipitated with barium chloride.

Drown (Institute of Mining Engineers, II, 224) suggested using potassium permanganate as an oxidizing agent, decomposing the excess permanganate by boiling with hydrochloric acid and precipitating the sulphuric acid with barium chloride.

Craig (*Chemical News*, XLVI, 199) suggested the use of an ammoniacal solution of hydrogen peroxide to absorb the hydrogen sulphide. This merely requires to be acidified with hydrochloric acid and precipitated with barium chloride.

Among the methods mentioned in the handbooks on gas chemistry we find in Newbigging the suggestion that the hydrogen sulphide be absorbed in a 10 per cent solution of copper sulphate, the copper sulphide is filtered off and the free sulphuric acid in the filtrate is titrated with ammonia, using methyl orange as an indicator.

Newbigging also recommends the use of the Harcourt colorimetric method. In this method the gas is bubbled slowly through a strong solution of lead acetate until a standard color is developed. When this point is reached, the gas which has passed through the apparatus is assumed to have contained hydrogen sulphide equivalent to 0.0025 grain of sulphur, which would be equivalent to 0.00262 grain of hydrogen sulphide. From the volume of the gas that has been used, the quantity of hydrogen sulphide present may be readily calculated.

Butterfield suggested, in addition to the Harcourt test, a gravimetric method which is a modification by Louis Wright (*Journal Chemical Society*, XLIII, 267) of an earlier method suggested by Fresenius (*Zeitung fur Anorg Chemie*, X, 75 [1875]), where the gas is first dried by means of calcium chloride and then passed through U-tubes containing pumice saturated with copper sulphate, followed by a layer of calcium chloride, the increase in weight giving the hydrogen sulphide directly.

Wright modified this method by using a cupric phosphate made by precipitating copper sulphate with disodium hydrogen phosphate. The bright blue precipitate is washed and dried, the test tubes are filled half with cupric phosphate and the rear half with calcium chloride; the gas is first passed through a tube of syrupy phosphoric acid, then through tubes of cupric phosphate and calcium chloride.

"O'Connor's Gas Engineers' Handbook" mentions Wright's test: the use of an acid solution of cadmium chloride, the cadmium sulphide being weighed; and Sheard's test, the same as that given in Newbigging, in which the hydrogen sulphide is absorbed by copper sulphate and the sulphuric acid formed titrated. He also gives the Harcourt color test.

"Abady's Gas Analysts' Manual" mentions the tests of Wright, Harcourt and Sherard, and gives a test which he calls Marshall's test, in which the hydrogen sulphide

*Paper presented at American Gas Association convention.

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is absorbed in caustic soda and is precipitated by the addition of arsenite of soda. This is really an adaptation of Mohr's method.

Folkard's test is described, in which a sample of the gas is collected in a glass tube by displacement and a standard solution of iodine is added until all the hydrogen sulphide is absorbed. The end point is determined by exposing a piece of lead acetate paper to the gas.

He also gives a test proposed by N. Greville in which the gas is passed through a solution of ammonia and the hydrogen sulphide determined by a titration with an ammoniacal copper-nitrate solution.

A modification of the Folkard's test is that described by J. A. Wankyln, in which a glass-stoppered bottle of known capacity is used to collect the sample. The hydrogen sulphide is absorbed by lead acetate solution. The end point is obtained by testing the gas with slips of paper saturated with lead acetate.

Grove and Thorpe in their "Chemical Technology" give Wright's gravimetric test and Harcourt's color test, and suggest that very accurate determinations may be made by absorbing the hydrogen sulphide in a sample of gas measured in a Bunte burette by a standard solution of iodine. The iodine is then washed out of the burette and the excess titrated by means of starch and thiosulphate.

Royle mentions Wright's gravimetric test and the use of acidulated cadmium chloride, and suggests the use of Wankyln's bottle, using a standard solution of iodine in which the iodine absorbs the hydrogen sulphide and the excess is titrated back with thiosulphate.

Hornby mentions Wright's gravimetric test, the Harcourt color test and an acid cadmium chloride solution.

The "Gas Chemists' Handbook" gives a gravimetric method using lead nitrate, a gravimetric method using ammoniacal solution of silver nitrate, ammoniacal cadmium chloride and a volumetric method using ammoniacal cadmium chloride.

The use of the Tutwiler burette is described, in which a sample of gas is drawn into a burette containing about 10 c.c. of starch solution and the hydrogen sulphide is absorbed by a standard solution of iodine, the end point being determined by the appearance of blue color in the starch solution. A blank is run on gas free from hydrogen sulphide and is subtracted from the result obtained in the test.

In addition to these methods, the general literature gives the iodine method of Dupasqiner, in which the hydrogen sulphide is absorbed directly into standard iodine, and the gravimetric method of Bunsen, who absorbed the hydrogen sulphide with balls made of manganese dioxide. The use of sodium hydroxide and sodium carbonate has also been recommended at various times for the determination of hydrogen sulphide.

In addition to the methods given, there are several colorimetric tests which depend on the formation of dyes, usually of the type of methylene blue, and a large number of modifications of the methods already given. There are two rather complete bibliographies, one by Bearley (*Chemical News*, 82, page 306) and another by Pulsifer (*Journal of Industrial and Engineering Chemistry*, 8, page 1119).

Discussion of Various Methods

The methods that have been outlined may be divided into several classes:

1. Colorimetric methods.
2. Methods in which the hydrogen sulphide is absorbed by lead acetate and the end point determined with lead acetate paper.
3. Methods in which iodine is used, either directly or indirectly, to absorb the hydrogen sulphide.
4. Gravimetric methods in which the hydrogen sulphide is determined by the increase in weight of the absorbing vessels.
5. Methods in which the hydrogen sulphide is absorbed in alkaline solutions or in alkaline solutions of metallic salts.
6. Where the hydrogen sulphide is absorbed in acid solutions of metallic salts.
7. Where the hydrogen sulphide is directly oxidized to sulphuric acid
8. Where the sulphuric acid set free by the reaction of the hydrogen sulphide and the metallic salts is determined.

General Requirements

In considering which method would be most likely to give us the results desired we had in mind (1) that the method should be quick, which practically requires a volumetric method; (2) that the apparatus should not be too complicated, and (3) that it should be accurate in the determination of small quantities of hydrogen sulphide—say, from ½ to 3 grains.

Colorimetric Methods

Owing to the well-known effect of different sources of illumination and the personal equation causing considerable errors in matching color standards, it was felt that the colorimetric methods would not be available for our work.

The colorimetric method proposed by Mecklenburg and Rosenkranzer (*Zeitung fur Anorg. Chemie*, 86, page 143), in which the hydrogen sulphide is absorbed in water acidulated with hydrochloric acid dimethyl paraphenylene diamine sulphate and a few drops of ferric chloride, methylene blue is formed and the depth of the color is found to be proportional to the concentration of the hydrogen sulphide. This method, while it will apparently give excellent results on pure samples of hydrogen sulphide, gave very erratic results when used with illuminating gas. A number of other methods were looked into, but did not seem to promise any better results. Among these were

Vgl. Classen Ausgewahlte Methoden, Vol. I, p. 525.
Bull. Soc. Chem., Paris (2), 43, (1885) 70.
Chem. News, 58 (1888), 41, 70.
Vgl. Treadwell, Lehrbuch der Analytischen Chemie, 299, 579—11 (6th edition).
Z. Analyt. Chem., 32 (1893), 41, 43—40 (1901), 722—52 (1903), 165, 641—53 (1914) 29.
Ber. 16 (1903), 2234.
Z. Angew. Chem., 21 (1908), 1359, 1394.
Stahl und Eisen, 22 (1902), 211.
Lindsay, School of Mines Quarterly.
Columbia University (1901), 23, p. 24.

The rough methods used under Class 2, absorbing the hydrogen sulphide with lead acetate, would likewise be ruled out.

Iodine Method

Under Class 3, methods using iodine either directly or indirectly, it was found that these methods always gave

results which were too high, due to the reaction of the iodine with unsaturated hydrocarbons.

Gravimetric Methods

The gravimetric methods were given a careful trial, although it was felt that they would not be convenient. The method of Fresenius using copper sulphate on pumice, Wright's method using cupric phosphate, Bunsen's method using manganese dioxide and another method devised by ourselves, in which we used a very active iron oxide, were all tried out.

Alkaline Solution

Coming now to methods in which the solutions of alkali or alkaline solutions of metallic salts are used in the absorption, we found that these methods all gave too high a result. This is apparently due to the reaction between the alkali and the carbon bisulphide and other organic sulphur compounds in the gas which result in the formation of products which liberate hydrogen sulphide upon acidification.

The reactions involved in the case of carbon bisulphide are probably:

$$3CS_2 + 6NaOH = Na_2CO_3 + 2Na_2CS_3 + 3H_2O$$
$$Na_2CS_3 + 2HCl = 2NaCl + H_2S + CS_2$$
$$CS_2 + 4NH_3 = NH_4CNS + (NH_4)_2S$$
$$(NH_4)_2S + 2HCl = (NH_4)_2Cl + H_2S$$

The reaction between carbon bisulphide and the alkaline solution proceeds rather slowly and the time factor appears to be of considerable importance.

It was found, for instance, that if the gas is passed slowly and for a long time through the solution the results are very much higher than if the gas is passed rapidly and for a short time through the solution. This was also checked up by using a number of bottles of alkaline cadmium chloride solution. The first bottle took up nearly all of the H_2S that was present, the second bottle took up very little, and the third and fourth bottles showed an increasing precipitate of cadmium sulphide, indicating that the reaction started in the first bottle had had time to progress, and the products of the reactions were absorbed in the latter bottles.

In one experiment ten bottles were connected in series, with the result that there was a precipitate of cadmium sulphide in each bottle, and the acetate paper placed at the outlet of the individual bottles was disworked out show that the first five bottles gave 7 grains per 100 cu. ft., the last five bottles 2.5 grains per 100 cu. ft., while the correct amount of hydrogen sulphide was 2.3 grains per 100 cu. ft.

Wrinkler's Method

The method of Winkler (Lehr. d. Tech. Gas Analy., 3d Ed. [1901], p. 146), in which the hydrogen sulphide is absorbed in an ammoniacal silver-nitrate solution, was modified for the same reason by using a saturated solution of silver sulphate. The precipitate was washed with dilute hydrochloric acid, which decomposes any silver acetylide, and the silver chloride formed is dissolved in ammonia, leaving silver sulphide on the filter. This was washed, decomposed with concentrated nitric acid, and the silver determined as silver chloride. This method appeared to give reasonably accurate results. It was very slow and tedious. A test made with gas containing 2.59 grains per 100 cu. ft. gave 2.25 grains.

Oxidation Method

The methods in which the hydrogen sulphide is oxidized directly to sulphuric acid with potassium permanganate or hydrogen peroxide were not tried, as the literature appeared to indicate that the other organic compounds could also be oxidized to some extent.

Titration of Sulphuric Acid Formed

The methods in which the sulphuric acid is determined in the copper sulphate solution by titration with ammonia, after filtering off the copper sulphide, were not tried, as previous experience had indicated that unless the copper sulphide was filtered in an inert atmosphere it was readily oxidized and would therefore give too high results.

Tests with Acid Cadmium Chloride Solution

There remained then to be investigated the methods using acid solutions of cadmium chloride, the use of which is recommended by several writers. Our preliminary tests indicated that the results obtained with acid solutions of cadmium chloride were apparently too low, as test papers placed on the outlet of the absorbing bottles indicated that traces of hydrogen sulphide were passing the solution.

The reaction between cadmium chloride with hydrogen sulphide is ordinarily expressed by the equation:

$$CdCl_2 + H_2C \rightarrow \quad \leftarrow CdS + 2HCl$$

There is a possibility that this chloride may also be formed according to the reaction:

$$2CdCl_2 + H_2S = 2HCl + Cd_2SCl_2$$

Since this is a reversible reaction, we might expect that it would be affected by the concentration of the hydrochloric acid.

In order to test out the effect of the hydrochloric acid concentration, a number of tests were made on solutions of neutral cadmium chloride through which gas containing approximately 100 grains of hydrogen sulphide per 100 cu. ft. was passed through wash bottles containing 200 c.c. of the solution at the rate of about 0.5 cu. ft. per hour.

The wash bottles were equipped at the outlet with a penetration test apparatus for detecting the first evidence of incomplete absorption of hydrogen sulphide.

When the lead acetate paper showed evidence of hydrogen sulphide escaping from the solution, the flow of gas was stopped, the precipitate of cadmium sulphide filtered off and washed, the filter paper containing the precipitate put in a liter Erlenmeyer flask containing about 500 c.c. of distilled water, and 25 c.c. of 1:1 hydrochloric acid added. The flask was immediately stoppered and thoroughly shaken until the cadmium sulphide completely dissolved. Additional hydrochloric acid was added if necessary to secure solution. The precipitate adhering to the dip tube and sides of the washing bottle was dissolved by first adding 100 c.c. of water, followed by 5 to 10 c.c. of 1:1 hydrochloric acid.

This solution was then added to that in the Erlen-

meyer flask. After the addition of 5 c.c. of fresh starch solution, the content was titrated with N/20 iodine until a pale blue tint persisted.

A similar volume of distilled water was then titrated after the addition of starch solution, and the necessary correction applied.

The results obtained were as follows:

$CdCl_2 2H_2O$	Theoretical H_2S Absorption per 200 c.c. Solution	Actual Absorption	Grains in HCl Liberated. Equa.
2%	9.56 grains	0.14 grains	0.30
5%	23.90 grains	0.40 grains	0.86
10%	47.80 grains	0.85 grains	1.82
15%	71.80 grains	1.59 grains	3.40

It is evident where we attempt to secure the complete absorption of the hydrogen sulphide in the gas we do not even approach the equilibrium and the results do not apparently indicate any direct relation between the concentration of the hydrochloric acid and the amount of absorption. It was found, however, that if we should calculate the concentration of the cadmium ions in the solution when hydrogen sulphide began to pass, and also the hydrogen ion concentration, that the cadmium ion concentration divided by the square foot of the hydrogen ion concentration was a constant.

Conditions in the Solutions when Hydrogen Sulphide Ceased to Be Completely Absorbed

Experiment	Grams (Cd) + per Liter	Grams (H) + per Liter	$C_{(Cd)} \div C_{(H)}{}^2$	$C_{(H)}{}^2 C_{(Cd)}$
2% solution..	3.74	0.00266	0.0516	72.5
5% solution..	6.08	0.00760	0.0872	69.7
10% solution..	9.07	0.01592	0.1262	71.8
15% solution..	11.65	0.02956	0.1720	67.8

Considering the rather rough method that was used, it is thought that the agreement on the constant is fairly good.

It might be mentioned in this connection that the data in the literature on the disassociation of cadmium chloride is not very concordant and the values used in this work were those obtained by Jones and his co-workers, given in Carnegie Institute Publication No. 170, and the values for the higher concentrations were obtained by extrapolation. We also checked this by making some determinations in the laboratory.

It is interesting to point out that if 2.6 ml. of the ordinary 22-degree hydrochloric acid is added to a liter of 15 per cent solution of cadmium chloride, the solution will not completely absorb hydrogen sulphide.

It would have been interesting to have determined what proportion of the hydrogen sulphide is absorbed and what proportion is passed forward, but this did not seem to be of sufficient importance, inasmuch as we had proven that there was a limiting hydrogen ion concentration beyond which all of the hydrogen sulphide is not absorbed.

Proposed Test for Hydrogen Sulphide

As a result of this work it seems evident to us that the only method of securing accurate determinations of hydrogen sulphide in illuminating gas would lie in the use of a neutral solution of cadmium chloride, using a sufficient volume of the solution in the bottles and arranging the conditions that there would always be one clean bottle of the cadmium chloride solution at the end of the train.

It appeared unnecessary to use solutions stronger than 15 per cent, as these will permit the determination of hydrogen sulphide in fairly high concentrations.

We therefore suggest the following method for the determination of small quantities of hydrogen sulphide:

Three ordinary pound reagent bottles are fitted with rubber stoppers containing inlet and outlet glass tubes for use as gas-washing bottles.

Two hundred cubic centimeters of a neutral 15 per cent solution of cadmium chloride are poured into each bottle and the inlet dip tubes adjusted to give approximately a half-inch seal.

The bottles are connected in series by rubber tubing and attached to the supply line at the point at which it is desired to make a test.

A suitable purge is provided directly before the inlet of the first bottle. A fourth bottle or any suitable form of apparatus is attached and a strip of lead acetate paper inserted to give visible evidence of complete absorption of the hydrogen sulphide.

A wet meter or aspirator bottle is connected to the train after the fourth bottle and an adjustable burner attached to the outlet of the meter. After setting the index hands of the meter, the rate of flow of the gas is adjusted to approximately 0.5 cu. ft. per hour and the test run for a period necessary to give a precipitate in the second bottle.

The solutions are then combined, filtered and the filter paper containing the precipitate put in a liter Erlenmeyer flask containing about 500 c.c. of distilled water and 25 c.c. of 1:1 hydrochloric acid added. The flask is immediately stoppered and thoroughly shaken until the cadmium sulphide is completely dissolved. Additional hydrochloric acid is added if necessary to secure solution.

The precipitate adhering to the tip tube and sides of the washing bottle is dissolved by first adding 100 c.c. of water, followed by 5 to 10 c.c. of 1:1 hydrochloric acid. This solution is then added to that in the Erlenmeyer flask.

After the addition of 5 c.c. of fresh starch solution the contents are titrated with N/20 iodine until a pale blue tint persists.

A similar volume of distilled water is then titrated after the addition of hydrochloric acid, and the starch solution and the necessary correction applied.

Accuracy of Method

The accuracy of the neutral cadmium chloride solution method was checked by making compressed dilutions of hydrogen sulphide of known purity with gas in a large glass bottle and passing the measured mixture through a regular absorption train.

The results obtained checked to within the limit of accuracy with which the hydrogen sulphide in the gas mixture could be calculated.

General Notes

As a result of our experiments we believe that it is entirely unnecessary to pass large quantities of gas, as accurate check determinations have been made on quantities as low as 0.15 cu. ft. This is a very considerable advantage in permitting tests to be made quite rapidly.

(*Continued on page* 531.)

Hand Tools

(*Continued from page* 518.)

Wrenches

Many injuries result daily in the use of wrenches. Workmen try to use a wrench of a larger size than the nut which they are tightening or loosening with the result that the wrench slips and the workman suffers a skinned elbow or a bumped head. Frequently also the jaws of the wrench are spread so that it will not hold the nut. Occasionally, when a wrench is too large for the nut, some workmen will use a piece of wood, a nail, or some other thin object as a shim. This is a dangerous practice and should be prohibited.

Wrenches should be placed on nuts the right way; that is, by facing the wrench forward in the way the handle is to turn. This prevents spreading of jaws.

There are several makes of safety wrenches on the market for opening drop-bottom coal cars. The ordinary wrench should not be used, as it is liable to fly around and strike the man using the wrench when the drop bottom falls with the load on.

Hatchets, Axes, Adzes, Etc.

Keen-edged wood-cutting tools, such as hatchets, axes, adzes, etc., should always be kept sharp, as a sharp tool is safer and more efficient than a dull one. It is important also that the handles of this type of tool be of the best material and carefully secured in place. Accidents in the use of these tools are frequently due to workmen leaving them lying around where they are stepped upon or struck against. Workmen must be continually warned in this regard. A good practice is to drive the tool, when not in use, in a block of wood so that cutting edge is embedded. For carrying such tools leather cases are often provided.

Saws, Planers, Drawknives, Wood Chisels

On account of the sharpness of woodworking tools workmen frequently have their hands cut by striking against the cutting edge. Inexperienced persons sometimes cut their forefingers or thumbs when starting a saw cut. It is advisable to make the first stroke of the hand saw upward. This gives a start into the wood with less chance of the saw jumping.

Wood chisels should be provided with good substantial handles. Where a mallet or hammer is used for striking the end of a chisel handle, it is a good practice to put a metal band around the end of handle to keep it from spreading.

Pliers, Wirecutters and Tongs

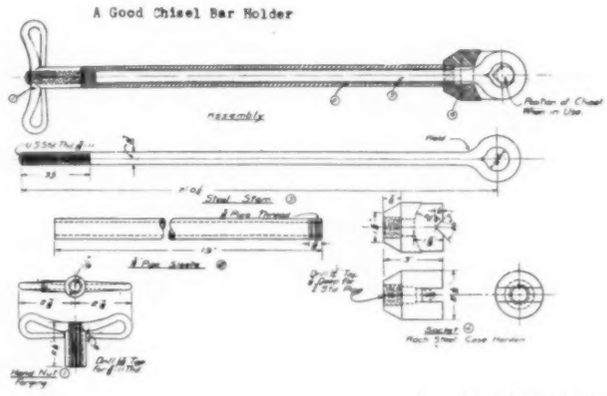
Pliers and wirecutters are not ordinarily dangerous. Men working on high-power circuits, however, frequently suffer electric shocks because they take hold of a live circuit with their pliers. It is thought, by many, that tape on the handles of pliers is sufficient insulation against electric shock from exposed wiring. Tape gives a better gripping surface, but the use of good rubber gloves is the safest. When cutting wire under tension, spring wire in coils, always take hold of the wire close to the cutters, and stand so that other end cannot fly into the face.

Chisels (for Cutting Metal)

Several different methods of safely holding chisel cutters, cold chisels, and bull chisels have been developed by members of the National Safety Council. One method is illustrated in figure 1. In the use of such tools the necessity for the men to wear goggles is quite imperative. Flying pieces of steel, concrete, etc., may cause severe eye injuries.

Shovels

It is important that every shovel be fitted with a good, strong, smooth handle so that workmen will not have their hands cut by splinters in the shovel handles. Shovels should not be left lying about the job where they will trip workmen or be bumped against and possibly cause cuts to feet or ankles. It is better that they be carefully stacked up, or stuck



in the ground so that the handles stand upright. They should not, however, be stuck in the ground where they are likely to be run against. Shovels should be turned into the tool room where they should be inspected for defects and kept stored in a proper rack.

Picks

It is of importance that the handles of picks be kept in good condition, smooth, and securely fastened in the pick. Some very severe accidents have occurred when the pick is at its highest point over the user's head by the steel pick sliding down the handle and hitting the man on the head or pinching his fingers severely.

Forks

Forks should not be left lying about where they may be stepped upon, or where they may trip the workmen. Fork handles should be straight and maintained in good condition. There is one caution common to shovels, picks, and forks. Where two or more men are using these tools on the same job, care must be taken that they are stationed so that they will not strike each other.

Lifting Jacks

Due care must be taken, naturally, to use jacks of sufficient strength. It is sometimes worth while to place a piece of wood between the head of a jack and

the load that is lifted, to prevent slipping of the jack from under a load. Improper centering of the load over a jack often causes the jack to kick out, resulting in serious injuries. In some cases men have been killed due to their being thrown off buildings by the kick of the jack. Accidents sometimes occur when a workman's hand is pinched by the falling head of a lifting jack. Care must be taken that hands and feet are in the clear when a jack is released.

Air Hammers

The principal hazard in the use of air hammers results from chisel or tool being thrown from the hammer. Workmen should not lay down a hammer in such position that the chisel or tool can be thrown out should the hammer be tripped. Several cases of serious injury have resulted from this cause. Whatever tools are in the hammer should be removed when the hammer is not in use, for a definite length of time. There are devices on the market for retaining the tool in the hammer.

Workmen must be careful when using air hammers on scaffolds or elevated positions over other workmen that their hammer does not fall. Attention must be given to the air hose to see that the weight of the hose does not pull the "gun" off the scaffold or beam where it is laid. Wire hooks fastened to the hose and hooked to convenient points will help hold the hose up and keep the strain off the "gun." From time to time men have been injured severely when the air hose has become disconnectd from the hammer. The high pressure of the air may cause the hose to slip around violently, and where a part of the coupling is attached to the hose it may strike the operator before he has a chance to clear himself and shut off the air. This hazard may be overcome by the use of a positive coupling where the hose joins the hammer.

One form of horseplay with compressed air tools is the so-called "goosing" by the use of the air hose. The placing of the nozzle of the air hose with air turned on against the rectum causes an influx of air into the intestines, thereby distending them until they burst. Death to the victim of the horseplay is the inevitable result. It is to be regretted that horseplay of this nature takes place from time to time, and everyone who uses compressed air in any way should be warned against all forms of fooling with it.

There are many injuries where these tools are extensively used, as in steel shipyards. Both air and electric drills and reamers "jam" and the power turns the air or electric engine with such force that workers are caught between the handles of the engine and some other object, breaking ribs, injuring hands, arms, etc., and frequently men are thrown from scaffolding and very seriously injured. Electric drills can be equipped with a valve that automatically shuts off the power when a tool "jams." An automatic device to break the circuit when an electric tool "jams" is needed at the present time, and one that would be convenient for application to each engine.

It is very important that electric drills and reamers have their frames grounded. This can be done by using armored cables and attaching ground connection to motor frame and at the "plug end" of cable, attaching a ground connection to suit conditions. Also, if armored cable is not used, a ground wire and plug connection to ground can be provided.

It is essential that the feed circuit for electric hand tools always be kept in a good condition with the feed wires well insulated. Periodic inspection of the feed wires should be made by a qualified electrician. It is advisable that feed wires be in a metal armored cable. In the use of air and electric hand tools, workmen are frequently tripped by the air hose or the electric cable leading to the tools. Some companies provide an overhead runway arrangement which carries the hose and cable, elevated out of the way. This prevents undue wear on the hose and cable and also removes the tripping hazard.

Screw Drivers

A screw driver presents several hazards in its use due to the tool being used for other than its intended purpose. This practice renders it unfit for its special purpose as a screw driver. The shanks become bent from using the driver as a punch bar. The points become rounded and worn and readily slip from the screw slot. The handles become split and splintered from hammer blows when used as chisels. A roughened or splintered handle is liable to form blisters on the hands of the users, in which infection may develop. The slipping of a screw driver from a screw head while the user was pressing hard against it has caused the loss of an eye and other head injuries, the sudden release causing the user to lunge forward and strike his head on near-by objects. Inguinal ruptures have also been caused by awkward bruises on the body, when the driving points have suddenly released from screw slots.

Wood Hooks, Cant Hooks, Peavies and Pickaroons

Wood hooks, cant hooks, peavies, pickaroons and other logging tools should be kept sharp, as it is much less dangerous to use sharp ones than dull ones. They should never be left lying about where they will trip or injure workmen. Provide racks for storing all hooks. This will insure that they are kept in better condition and will not become lost. The handles should be securely fastened to the head of tool.

Determination of Hydrogen Sulphide in Illuminating Gas

(*Continued from page 529.*)

In connection with the making of a large number of these hydrogen sulphide tests we have found that the ordinary 5-gal. bottles used as an aspirator will give very accurate results if care be taken to correct for temperature and to bring the pressure of the gas in the bottle to atmospheric before reading the amount of water displaced. This is a great convenience, as it saves the rather costly investment in expensive wet meters, which require constant care in handling to insure accurate registrations.

In connection with the determination of the end point, we did not find any difficulty due to the appearance of the red color in the solution that according to Jayson and Oesper (J. I. & E. C. 10, page 975) becomes evident when the concentration of hydrochloric acid (1:1) is above 30 c.c. per liter. Our concentrations were approximately this or did not exceed it by more than a few cubic centimeters, nor did we find any difficulty in securing the solution of the cadmium sulphide at this concentration.

Estimation with Colored Sulphides

In connection with this work we endeavored to find some more rapid test that could be handled by the men in the purifying house. A considerable amount of work was done on a color test in which paper treated with lead acetate or silver sulphate was exposed to the gas in a standard apparatus for a certain length of time and the color compared with standard test slips, but the skill required to differentiate the colors and the effect of the illumination appeared to render this test impractical. Experiments were then made on solutions of different salts which formed colored sulphides.

The compounds used, arranged in the order of sensitiveness, were as follows:

1. Lead acetate ($Pb[C_2H_3O_2]2$): 5 per cent solution. Black sulphide.
2. Silver sulphate (Ag_2SO_4): Saturated water solution. Gray-black sulphide.
3. Copper sulphate (C_2SO_4): 5 per cent water solution. Plack sulphide.
4. Antimony trichloride ($SbCl_3$): 3 per cent water solution. Dissolve by adding HCl. Orange sulphide.
5. Cadmium chloride ($CdCl_2$): 5 per cent water solution. Yellow sulphide.
6. Mercuric chloride ($HgCl_2$): 3 per cent water solution. Black sulphide.
7. Bismuth trichloride ($BiCl_3$): 3 per cent water solution. Dissolve by adding HCl. Brown sulphide.

The solutions are placed in the necessary number of small vials, about ¼ in. in diameter and 2 in. in height, arranged in a column on a wooden block and placed as closely together as will permit convenient filling and cleaning.

The same number of glass rods are fitted into a second strip of wood, forming a comb-like apparatus, and arranged to dip freely into the glass vials containing the solutions.

In making a test the comb is dipped into the solutions and then pressed on a strip of Whatman hardened filter paper of the proper size, leaving small circular spots of the compounds used.

The filter paper is immediately put into a standard form of hydrogen sulphide tester (see page 28, Technological Paper 41, Bureau of Standards) and the gas under test passed through at the approximate rate of 5 cu. ft. per hour for one minute.

The compounds will show color from 1 to 7, according to the concentration of hydrogen sulphide in the gas.

The procedure in determining the concentration of hydrogen sulphide necessary to give apparent coloration to the spots of the compounds used was as follows:

A 14-liter bottle was fitted with suitable connections, having a thermometer, and an inlet and outlet tube inserted in the stopper.

Hydrogen sulphide generated either from barium sulphide or ferrous sulphide was measured in a Hempel gas burette and various amounts introduced into the bottle. The residual, unused hydrogen sulphide, was absorbed in potassium hydroxide and a correction applied for impurities, such as hydrogen, if present.

The inlet tube to the bottle was then connected to a pressume pump and gas free from hydrogen sulphide was introduced until the pressure was approximately 620 mm. above atmospheric.

This increased the corrected value of the mixture in the bottle from about 0.48 cu. ft. to 0.86 cu. ft.

The test papers were prepared, put in the standard form of apparatus and the rate of flow regulated to 5 cu. ft. per hour by means of a flow-meter. An ordinary U-gauge can be placed in the inlet gas and readily calibrated to give the desired rate of flow.

After a test the pressure was released to atmospheric and gas again introduced, making a second dilution and so on for so many dilutions as desired.

The following table gives the results of a series of tests made by this method:

Grains of H_2S per 100 Cu. Ft.	Compounds Showing Distinct Coloration 1 Min. Test	Compounds Showing Faint Coloration 1 Min. Test
0.05		Pb-Ag (very faint)
0.10		Pb-Ag.
0.18	Pb-Ag.	
0.33	Pb-Ag.	Cu. (very faint)
0.59	Pb-Ag.	Cu.
1.05	Pb-Ag-Cu.	Sb. (very faint)
1.86	Pb-Ag-Cu-Sb.	Cd. (very faint)
3.36	Pb-Ag-Cu-Sb-Cd.	
6.03	Pb-Ag-Cu-Sb-Cd.	Hg (very faint)
10.80	Pb-Ag-Cu-Sb-Cd-Hg.	
12.50	Pb-Ag-Cu-Sb-Cd-Hg Bi.	

From this table it will be seen that a coloration with lead acetate and silver sulphate alone indicates between 0.05 and 1.18 grains, copper sulphate shows color at 0.33 grain, antimony trichloride at 1 grain, cadmium chloride at 1.9 grains, mercuric chloride at 6 grains and bismuth trichloride at 12.5 grains.

This test should be very useful in checking up the efficiency of purification, giving a sufficiently accurate figure for the amount of hydrogen sulphide escaping the purifying boxes to be of value.

Further investigation of the formation of colored sulphides will probably fill in the gap between 6 and 10 grains.

It has been our experience that silver sulphate is to be preferred to lead acetate for testing purified gas when the record of the test is to be preserved, as it was found that the silver sulphide stain did not change to the same extent as lead sulphide, especially where the stain was very faint.

Coal Miners' Wages

Although the agreement made between the Government and the coal operators, concerning the wages to be paid to the miners, does not terminate until April, 1922, the independent operators construe the agreement as only applying to the companies known as the "trust," as was witnessed in West Virginia and now looms in Colorado.

The Colorado law makes it compulsory that no wages may be reduced, nor shall any strike be called unless the parties desiring to take such action give thirty days' notice to the State Industrial Commission. Notice has been given the State Industrial Commission by five independent companies that they must reduce wages back to the 1917 scale, and if the commission grants their plea the wage scale will be effective starting 1922.

The reasons given as the necessity: "We must do it to meet our competitors and give work to more men."

Public Utilities Securities Market Report

Prices of Representative Gas Bonds

(Quotations furnished by The National City Company)

Company	Issue	Maturity	Dec. 8, 1921 Bid	Asked
American Lt. & Trac. Co.	Five Year 6s	May 1, 1925	96	96⅜
Brooklyn Union Gas Co.	First Consol. 5s	May 1, 1945	89	91
Columbia Gas & Elec. Co.	First 5s	May 1, 1945	89¼	90
Consol. Gas, Elec. Lt. & Pr. Co. of Baltimore	First Ref. 7½s	Dec. 1, 1945	105	106½
Consol. Gas, Elec. Lt. & Pr. Co.	General 4½s	Feb. 14, 1935	83	84
Consol. Gas Co. of New York	Sec. Conv. 7s	Feb. 1, 1925	104¼	104¾
New Amsterdam Gas Co.	First Consol. 5s	Jan. 1, 1948	80	85
Denver Gas & Elec. Co.	Gen. (now 1st) 5s	May 1, 1949	82	85
Detroit City Gas Co.	Gold 5s	Jan. 1, 1923	96	98
Equitable Illum. Gas Lt. Co. of Philadelphia	First 5s	Jan. 1, 1928	99	102
Hudson County Gas Co.	First 5s	Nov. 1, 1949	80	85
Laclede Gas Light Co.	Ref. & Ext. 5s	Apr. 1, 1943	85	87
Louisville Gas & Elec. Co.	First & Ref. 7s	June 1, 1923	98	101½
Michigan Light Co.	First & Ref. 5s	Mar 1, 1946	80	85
Milwaukee Gas Light Co.	First 4s	May 1, 1927	84½	87
Pacific Gas & Elec. Co.	Gen. & Ref. 5s	Jan. 1, 1942	89½	90
Pacific Gas & Elec. Co.	Col. Tr. Conv. 7s	May 1, 1925	100	101
Pacific Gas & Elec. Co.	First & Ref. 7s	Dec. 1, 1940	106½	108
Cal. Gas & Elec. Corp.	Unif. & Ref. 5s	Nov. 1, 1937	93	95
Peoples' Gas Lt. & Coke Co.	Refunding 5s	Sept. 1, 1947	83	85
Chicago Gas Lt. & Coke Co.	First 5s	July 1, 1937	87	89
Portland Gas & Coke Co.	First & Ref. 5s	Jan. 1, 1940	84	86
Seattle Lighting Co.	Refunding 5s	Oct. 1, 1949	73	77
Southern California Gas Co.	First 6s	Nov. 1, 1950	92	97
United Gas Improvement Co.	Two Year 8s	Feb. 1, 1923	100⅝	101
Utica Gas & Electric Co.	Ref. & Ext. 5s	July 1, 1957	83	86
Washington Gas Light Co.	General 5s	Nov. 1, 1960	90	92
Western States Gas & Elec. Co. of California	First & Ref. 5s	June 1, 1941	81	85

Ten-Million-Dollar Bond Issue

The Pacific Gas & Electric Company has been authorized by the Railroad Commission to issue and sell for cash at not less than 94¼ per cent of their face value and accrued interest $10,000,000 of first and refunding mortgage 6 per cent gold bonds of series "B," dated Dec. 1, 1921, and payable Dec. 1, 1941. According to the testimony at the hearing the National City Company has agreed to take the issue under terms approved by the commission. Under the terms of the order, the proceeds from the sale of the bonds are to be deposited with the trustee under the company's first and refunding mortgage of Dec. 1, 1920, and expended only as authorized by the commission. The money is to be used to reimburse capital expenditures and to meet authorized and estimated construction expenditures aggregating $14,173,436.60.

United G. & E. Retires Notes

The United Gas & Electric Corporation has been gradually moving into a better market position as evidenced by the improved showing it made in its latest statement of earnings, published last week.

The company has been able to retire some $711,100 of its certificates of indebtedness, leaving only $925,800 now outstanding. It also surrendered for cancellation $1,634,000 of the five-year 8 per cent sinking fund gold notes of the United Central Oil Corporation held by it, taking in exchange therefore, 81,700 additional shares of the latter company which now gives it stock control of this important oil subsidiary; $292,000 of the Oil notes had been retired previously by action of the sinking fund, thus redeeming the entire issue of $1,926,000 and releasing approximately $200,000 annual earnings for treasury requirements.

Brooklyn Union Plans Issue of $10,800,000

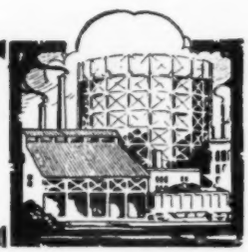
Brooklyn, N. Y.—Application for permission to issue stock, bonds and notes for more than $10,800,000 has been filed with the Public Service Commission by the Brooklyn Union Gas Company and its four subsidiary companies.

On its own behalf the parent concern wants permission to issue any of the several evidences of indebtedness in order to obtain $5,582,000, representing the differences between expenditures for improvements and extensions of its plant and distributing system of $8,232,507.66, and an issue of $2,650,000 of 7 per cent debenture bonds during the period from Aug. 1, 1911, to July 31, 1921.

In its application the company states the cost of its plant on July 31 last was $47,033,066.60; that replacement cost would be $60,000,000; that the money spent in improvements and extensions was borrowed, and that the time for payment is nearly at hand.

The details of the proposed issue regarding whether it will be a stock or bond issue or divided have not as yet been formulated. In view of the near maturities, the company merely applied for permission in order to provide against contingencies.

NEWS OF THE GAS INDUSTRY



Pennsylvania Gas Association Holds Mid-Year Meeting

Large Attendance Marks Innovation—Splendid Program Proves of Real Interest

Harrisburgh, Pa.—The first mid-year meeting of the Pennsylvania Gas Association, held here on Wednesday, Dec. 7, brought out a large number of gasmen from all parts of the State and proved that the innovation met with the approval of the members. It has been the custom to hold only the annual convention, but this year it was decided to add the meeting held on Wednesday.

The program of the meeting was excellently laid out and proved to be of real interest. Following the regular business of the association, reports were heard from various members who had attended the annual convention of the American Gas Association in Chicago. Brief digests of the papers presented at Chicago were given so that those who found it impossible to attend the big gathering were put in touch with the national aspects of events in the gas industry.

Following the presentation of these reports, H. H. Ganser, manager of the Counties Gas Company, Morristown, Pa., reported for his committee, which has been working with a committee from the New Jersey Gas Association on the formation of the Eastern States Gas Conference, an organization which it is hoped to form, and which will function in a fashion similar to the New England Gas Association or the Southern Gas Association. W. Griffin Gribble presented the proposed articles of the conference.

Mr. Ganser stated that it was hoped that the new conference will soon be active but that final action had not been taken on the report by the New Jersey association. This matter will be taken up by the latter organization during January, it is understood, and, if favorable, plans will be made for future activities. In addition to the two States mentioned, Delaware, Maryland, West Virginia and the District of Columbia will be included in the proposed organization. The conference will work along lines that have been suggested by the American Gas Association.

Thomas R. McDowell, field representative of the Pennsylvania State Highways Department, gave an interesting talk on the good roads work of that State.

At the conclusion of luncheon, A. I. Phillips, of the American Gas Association gave an interesting talk on his observations during his recent trip to England. Mr. Phillips spoke along lines similar to his speech at the American Gas Association convention which has been fully reported by the AMERICAN GAS JOURNAL. He prefaced his remarks, however, by stating that he believed that Dec. 6 should go down in public utility history as an epoch-making day, for that was the time when President Harding recommended a constitutional amendment to eliminate tax exempt securities, in his speech to Congress. Mr. Phillips read an extract from that address.

The afternoon session was devoted principally to a paper on "By-Product Coke Ovens in the Gas Industry," by B. W. Winship, superintendent of the Bethlehem Steel Company coke ovens. This paper will be presented in these columns next week.

Much of the success of the meeting was due to the arrangements committee which consisted of L. S. Williams, chairman; George L. Cullen, secretary and treasurer of the association, and J. Ward Crankshow. E. L. Smith, of the Tonawanda Gas & Electric Company and president of the association, presided. The meeting was one of the liveliest that has been held by any State association and proved the wisdom of the mid-year meeting.

Asks Merchants to Co-operate

Atlanta, Ga.—In a recent address before the Atlanta Retail Merchants Association, Preston S. Arkwright, president of the Georgia Railway & Power Company, urged the merchants of the city to take an active stand in creating the proper public sentiment in order that utilities might expand to meet the growth of the community and be prepared to serve new industries. He declared that many public utilities are unable to grow and expand because of public sentiment influencing railroad and utility commissions so that reduced rates are made effective, and this robs the companies of needed capital to make such improvements as are necessary. Merchants were urged to co-operate and do all in their power to create good-will for the public utilities as the only means that will insure the rapid growth and expansion of any community.

Gas Service Price Cut

Hartford, Conn.—The State Public Utilities Commission has ordered the Stamford Gas & Electric Company to cut its monthly service charge from 75 cents to 50 cents.